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adaptation is, or may be, disorderly. As a matter of fact variations with reference to specific conditions are eminently systematic. Otherwise how could a Cuvier or an Owen reconstruct the whole extinct animal from a single bone? Adaptation is orderly, though its teleological aspect introduces a new conception of order which justifies the distinctive adjunct, *dynamic*. Teleology is broad enough in its meaning to cover the whole field of adaptations, both in biology and in nature at large. We use it in the strict scientific sense to designate actual adaptations to specific conditions. Its use—or abuse—in natural theology is quite another affair.

Teleological relations have a very reliable degree of constancy; judgments and inferences based upon them approach about as near to ideal certainty as human reason can usually attain on any other grounds. Thus the logical value of teleology is twofold; it makes a direct contribution to the number of reliable logical constants, and it serves as a safeguard both of philosophical neutrality and against ultraformalism, a safeguard which is effective so far as nature's wholesome example can be effective. A logic characterized by mechanical rigidity stubbornly persisting in the face of prolific and flexible modifications of order-types, must at any rate forfeit all claim to be a natural system.

Logical constants are, however, for the most part based upon static order. Nearly all, if not all, of our examples already cited would come under that category. The old theologians might indeed see a purpose in the relation, steam—boiling water, but it would be a fanciful purpose like Derham's alleged function of volcanoes as warnings of hell-fire. Static order is first in logical priority and first in importance. It is the solid cornerstone of the logical superstructure.

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## A NEW CONTENT COURSE IN PHILOSOPHY[1]

I HAVE had some difficulty in devising a title for this paper. I thought at first of calling it "Neo-Positivism," and then it seemed that "Neo-Synthetic Philosophy" would meet the situation better, but further reflection indicated that each was too ambitious. I decided, therefore, to adopt the modest title that has been announced, although some perhaps may object that it is not strictly a content course, while others may deny that it is new, and still others that it is philosophy at all. Both objections and denials are prolific within our peculiar field. None the less, since some kind of title was necessary, I selected the one that erred, if at all, on the side of simplicity, rather than on the side of pretentiousness, although I am fully convinced, and I hope you will be too, that the general direction of my thought is both positivistic and synthetic.

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[1] Read at the meeting of the Western Philosophical Association at the University of Wisconsin, Madison, Wis., April 17, 1920.

For a number of years I have been convinced that an attempt to give a kind of cross-sectional view of the world upon the basis of what the various sciences are furnishing to-day would meet a real need in our college work. Most students who graduate from our colleges know something about a limited number of the sciences. Usually physics, chemistry, and biology, together with psychology and some one or two of the social sciences, constitute their entire scientific programme, and, indeed, they are fortunate if they get all these. But the field of the sciences has grown enormously within the last few years, both in the subjects treated and in the accumulation of material within their respective fields. It is true that some familiarity with the more important results is obtained through introductions to philosophy and kindred subjects, but not a little material in connection with such courses is rather necessarily more or less ancient, so that the students may be fully a lap or two behind current scientific views in the several fields. Of course, rigorous work in metaphysics would put students into touch with the most essential views of present-day scientists, but the number of students in the ordinary college who explore the mysteries of pure metaphysics is deplorably small. Consequently it has seemed to me advisable to introduce students to some fifteen or twenty different sciences so as to develop for them, as I have already indicated, a cross-sectional view of the world as the scientists themselves are presenting it.

I suspect that my thought was led in this direction by a series of lectures given at Columbia University in 1908 by some fifteen or more professors, each presenting his own field and trying to indicate within the limits of an hour or so what were the most assured results, the outstanding principles best attested in that field up to date.[2] It was an attempt to give within brief compass a comprehensive survey of the truths best substantiated in each of those fields at that time. Then, too, at about the same time, I learned of a new course that was being tried out on the freshmen in the same institution. This was designed as an orienting course. Several professors, representing different departments, gave each a series of eight lectures on his own particular subject, so that the freshmen might get a slight acquaintance with a large number of fields in order to decide rather early in their academic career what subject they would particularly care to specialize in. My own plan, I am very sure, was contained as a germ in these attempts, but the way in which I have developed it is not strictly dependent upon either or both.

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[2] Columbia University, *Lectures on Science, Philosophy, and Art*, 1907–1908.

When I first began to develop this new course in mind and to reflect upon its requirements, the field seemed too vast, too complicated for any one man to present even in outline. Several years later, however, I began to get acquainted with the little books published by Henry Holt & Co. in the series known as "The Home University Library of Modern Knowledge," and at once I became convinced that here was just the material needed. No opportunity, however, came to put my plan into operation until the present year, when with the accession of an assistant professor to our Hamline Faculty to take the introductory psychology off my hands I felt free to attempt some new work. The course which I have designated "The World of To-Day" is an actual putting into concrete form of the plan meditated for several years.

The course extends throughout the year, but the usual distinction between the inorganic and the organic worlds makes it possible to divide the subject-matter rather nicely according to semesters. At the outset last fall, I spent about three weeks on the little book in this series entitled *An Introduction to Science,* and then passed to a work on *Astronomy.* Ordinarily I have spent about two weeks on a book, but sometimes the material would demand a little more time and occasionally a little less. Since not all in the class had had specific training along the line of the general nature of science, it seemed wise to dwell a little longer upon the first topic. From the work on *Astronomy,* we passed to one on *The Making of the Earth* and then to one on *The New Geography,* another on *Polar Explorations,* and still another on *The Ocean.* Only a few selected topics were stressed from these last three books, such as the action of glaciers, the formation of icebergs in the Antarctic regions, and the general character of the waters of the ocean, its depth and currents, and a little contained in these three books on climate and weather. We then passed to a book on *Chemistry,* selecting the more salient topics, and then to *Matter and Energy,* more particularly the latter topic. This afforded a good opportunity to hark back to some of the material considered in connection with the work on astronomy, such as that which dealt with the "white nebulæ," and to connect that with the latest work on radio-active substances. At the beginning of the second semester, I dwelt somewhat longer upon a book entitled *The Origin and Nature of Life,* particularly that part which deals with the colloidal substances, and then took up *Plant Life* and *The Evolution of Plants.* From this point, we turned to a book on *Animal Life* and next to one on *Man,* with special emphasis upon the development of the latter from the former. Next came a book on *The Principles of Physiology;* then one on *Psychology,* with brief reference to the growth of psychic phenomena parallel with the development of animals from the simple to the more complex; next a glance at a volume on *Psychical Research,* and lastly a hasty sketch of the organization of society. There is no book in the series with the specific title of *Sociology,* but there is some material of this nature in the volume on *Anthropology.* I do not speak quite so positively, perhaps you will note, with reference to these last few topics, because I have not yet given this part of the work, but that is the general programme that I am planning to follow. In connection with these several books, I may add, required readings from parallel works in the library are due each week and there is a written test on the average every two or three weeks. There are also free discussions at practically every class exercise and a final written examination covering the entire work of each semester. Such is the general plan of the course.

And now I want to give briefly several of the thoughts developed in the minds of the class by this method. In the first place, when we follow the lead of the astronomer, we become somewhat acquainted with the tremendous stretches of space which are all aglow and which have been denominated "white nebulæ." There is not entire unanimity in the interpretation of these nebulæ, but Moore, in the volume on *The Origin and Nature of Life,* suggests that there may be a double process taking place. "The chemist knows," he says, "that at the balancing point a reaction may run in either direction, varying with a slight disturbance towards synthesis or disruption." So, he suggests, "at this enormous temperature, either there is visible before our eyes dissociation of matter into its very first and simplest forms, or, it may be that the available high energy concentration at such a temperature is actually synthesizing and producing from the ether those first steps in the formation of matter." Moore himself inclines to the latter view and maintains that various unstable combinations of electrons are formed there, but that out of the variety of such combinations ultimately here and there actual atoms become fixed, and these have never yet, he maintains, been broken up under laboratory conditions. The atoms of Uranium, he suggests, have never yet reached stability, but are disintegrating, unravelling so to speak, and by their behavior they have let us into a secret of the universe that perhaps we could not have otherwise learned, or at any rate could not have learned so soon as we have.[3]

In this connection, too, I deal with both the older "nebular hypothesis'' and the more recent ''planetesimal theory,'' and then, having landed upon the solid earth, I discuss the theories of the process by which the earth has come to have such a crust as we now know, the nature of the interior of the earth, some of the characteristics of earthquakes, and the formation of primary and secondary rocks. I take up next the problem of life, both from the angle of the strict scientific biologists who insist upon the formula *omne vivum e vivo* and of those more speculative biologists who assert that the general evolutionary theory demands the origin of life from the non-living here upon our own planet. At this point I find Moore especially helpful. He calls attention to the chemical principle of valency and insists that there is something similar in the behavior of molecules, particularly those huge aggregations, comparatively speaking, in more or less unstable equilibrium, which are at the basis of those colloidal substances from which living things were born. If we follow him in this view, we are prepared to appreciate the naturalness and simplicity of all early forms of life, and also the closeness of relation between the two generally accepted fields of living things and their cooperation. In this connection, too, I call attention to the many variations in the relations of the animal units to one another, and more especially to the varied relations within the limits of humanity. I dwell somewhat upon the instability of such relations in primitive life and enlarge upon the combinations that have been made of groups into nations only to be resolved back again into the original units, but to be combined again and again, until in these recent years the conception of a World-State has tentatively disclosed itself to our view. All this is easily regarded as parallel with the original tentative character of the early combinations of electrons in the vast nebulæ into *quasi* and then ultimately into actual atoms. Temporary instability of combinations seems to have been the rule, but this has been succeeded by stability all along the line, suggesting, perhaps, the ultimate World-State, but that time is not yet.[4]

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[3] Pp. 57–58, 68–104.

An immediate application of such a survey as this to the field of thought is very easy. I indicate to the class that just as there have been combinations of electrons into atoms and of molecules into such substances as colloids, all being originally rather temporary but settling down finally into stable relations, so there have been many temporary interpretations of the world. Individual experiences of the world have been combined rather tentatively, but out of the plurality of such interpretations there have come at different stages of social development huge thought-schemes, or philosophies, which have served their day and generation, and indeed many succeeding generations, in a fairly satisfactory manner. Sooner or later, however, these aggregations of thought have tended to be set aside in favor of new combinations that meet the new, changed conditions better. Every such earlier formulation of thought on a large scale could be regarded as similar to the temporary combinations of electrons into *quasi* atoms, or as similar to the various kinds of colloids that were presumably tentatively formed before chlorophyll was ultimately developed as the basis of plant life. In this connection, too, it has been easy to point out that whatever individuals or peoples are apparently entirely satisfied with a particular thought-combination there we have the so-called conservatives, while those who at least try to make provision for the new material by incorporating it with the old or by modifying the old until it does include the new or, indeed, by making a new world-view out of the new material, whether it includes the old or not, are the more open-minded, progressive people of a community.

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[4] Moore, *The Origin and Nature of Life*, pp. 123–158, 188–189.

Another matter that I consider of no little importance comes out in connection with the little book on *The Evolution of Plants.* In that the principle is clearly enunciated that the more complex a form becomes the less is it likely to vary to meet changed conditions.[5] In other words, the simpler forms are the more plastic and better able to meet the changed conditions in their particular environment. The whole course of plant evolution shows a kind of zig-zag progression. Certain forms became decidedly complex and well adjusted to the conditions prevailing in a particular period or era, but when some of those great changes came, of which the geologists tell us, the more complex forms tended to disappear, while the simpler were able to become modified along somewhat different lines, and consequently they not only perpetuated themselves but overspread the earth in succession to the earlier complex forms which could not accommodate themselves to the changes. An application to the field of education grows directly out of this. The more highly specialized a man is in his education, the less readily can he meet changed conditions. Of course, ordinarily, the conditions of life are likely to remain fairly constant during the lifetime of any individual, but such a cataclysm as the Great War might seriously interfere with a highly specialized programme.

Parasites, also, proved to be an interesting subject, and one of not a little direct application to present-day social discussions. The term itself is not a popular one, except as a mark of opprobrium in some of the current radical socialist literature. None the less, the entire animal world can be regarded as a parasite, dependent as it is upon the vegetable world. Not a few technical parasites, too, seem to serve a useful purpose. For example, the *bacillus radicola* obtains its nourishment from the plant whose roots it inhabits, but at the same time it makes use of the free nitrogen of the atmosphere and thus furnishes rich nitrogenous matter to the plant itself for the production of protoplasm. "This is one of the very few organisms," Farmer says in his book on *Plant Life*, "which can perform this really stupendous task."[6] I am not developing a brief for the entire genus, nor for all within the limits of the human family often designated as such, but I am suggesting that some of the latter, while apparently only parasites, may actually make valuable contributions to our exceedingly complex social life.

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[5] Scott, *The Evolution of Plants,* pp. 154–155, 229–239.

As a final illustration of the possibilities in a course of this sort, I will submit the following: When we view the developing animal world from the amœba up to man, we may fasten our attention upon the nervous system, rather than upon the gross physical structure. Beginning in a very simple form in the hydra, it becomes more and more complex until the human brain is reached. This would seem to be the most valuable product of what we call the natural processes. Perhaps Nature herself, with the soft pedal upon the apparent personification, has reached her limit in this, her offspring. Think for a moment of the transformations which the universe has undergone from the nebulæ to the brain of man! But while Nature herself, following her usual course, may have reached her limit in the physical constitution of the human brain, the permutations and combinations of the neurones which make up that brain are practically infinite, suggesting almost infinite further modifications of Nature herself. In other words, we may say that the brain of man, brought forth from the womb of Nature, is an instrument by which Nature, having reached her limit by earlier methods, may continue to transform herself beyond almost any limits which we may at present assign. I know of no more inspiring thought than this at present to set before the minds of bright college men and women. If they learn to use their minds properly, they can cooperate with Nature in manifold transformations of the world in which we live; transformations, indeed, beyond anything, perhaps, of which we yet have dreamed.

Such, then, very sketchily, is the course. An objection that might readily arise, in addition to the one already partly met as to the source of the material, is that no man can make himself sufficiently familiar with all this vast field to guide students through it judiciously. My reply would be that those of us who teach the history of philosophy have a still vaster field to deal with. If we can make ourselves fairly familiar with the main outlines of Aristotle's metaphysics and of his various individual sciences; if we can follow through the intricacies of Plato's thought, deal adequately with the Stoics, Plotinus, and the Schoolmen; and if we can then wrestle at all successfully with Spinoza, Leibniz, Kant, Fichte, Schelling, and Hegel, to say nothing of more recent writers, we certainly ought to be able to follow any or all of the modern scientists, especially when their views are condensed severally, as in the Holt series, within the limits of 250 small duodecimo pages.

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[6] P. 196.

I might add, in closing, that I am planning a companion course for this one to be given next year. This aims to give a philosophic survey of what the human spirit has produced. It will deal with primitive life, both savage and barbarous, and with early and later civilizations. Modes of life, inventions, beliefs, forms of government and economic activities, art, literature, philosophy, and various contributions to modern life are some of the topics that will be treated as elaborately as time will permit. Much of our work in college is very fragmentary. Detailed studies of very limited fields are made and the student is expected to put together these *disjecta membra* into an illuminated and inspiring view of the world as a whole. The theory, within certain limits, is good, but there are not a few graduates who never "see the woods for the trees." The philosopher's function is largely to use the telescope, but not on a vacuum. In so far as he can make use, descriptively and appreciatively, of the results of the many sciences, both physical and social, and synthesize these into broad, helpful interpretations of the world as it is at the present day, will he more and more justify his position on a college faculty.

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## REVIEWS AND ABSTRACTS OF LITERATURE

*Problems of Science and Philosophy:* Volume II. of the Papers of the Aristotelian Society for 1919. Pp. 220.

To the man on the street the word science connotes a laboratory crowded with glass and with brass, monstrous implements for exact measurement, flasks and retorts and balances, graphs and outlines and all the other paraphernalia of the trade. And one suspects that the man in the seminar has not a very different conception of this term which is said to give its individuality to our century. Science and experimentalism; they are taken to mean very much the